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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/722,841

Applicant(s)

BAUMBERGER, DANIEL P.

Examiner

ERIC C. WAI

Art Unit

2195

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 May 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 and 31-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 and 31-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-20, and 31-61 are presented for examination.
2. In view of the Pre-Brief Conference request filed on 05/20/2009, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
4. Claims 31-34, 38-40 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.
5. Claim 31 recites a "system"; however, it appears that the system would reasonably be interpreted by one of ordinary skill in the art as software, per se, failing to be tangibly embodied or include any recited hardware as part of the system.
6. Claims 32-34 and 38-40 are rejected for not curing the deficiency of claim 31 above.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 5, 7-9, 14-17, 19-20, 31-40, and 45-61 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. The following terms lack antecedent basis in the claims:

- i. Claim 14 line 1, "the transmitting buffer"
- ii. Claim 14 line 3, "the receiving buffer".
- iii. Claim 35 line 2, "the first and second memories", and "the memories".
- iv. Claim 54 line 1, "the virtual memory elements".
- v. Claim 61 line 1, "the virtual memory elements".

b. The following terms are not clearly understood in the claims:

- vi. Claims 5 and 15 line 1 recites, "wherein first virtual device". It is unclear whether the device referred to is the same as the first virtual device of claim 4. If they are the same, "the" or "said" should be used.
- vii. Claims 7 lines 1-2 recite, "a first virtual machine". It is unclear whether the first virtual machine is different from the first virtual machine of claim 1. If it is the same, "the" or "said" should be used. Line 2 recites, "a second virtual machine". It is unclear whether the second virtual machine is different from the second virtual machine of claim 1. If it is the same, "the" or "said" should be used.
- viii. Claim 8 is rejected for the same reasons as claim 7 above.

ix. Claim 9 line 1 recites, “a transmitting memory element”. It is unclear whether the transmitting memory element is different from the transmitting memory element of claim 1. If it is the same, “the” or “said” should be used. Line 2 recites, “a shared physical memory element”. It is unclear whether the shared physical memory element is different from the shared physical memory element of claim 1. If it is the same, “the” or “said” should be used.

x. Claim 14 line 1 recites, “the transmitting buffer”. It is unclear whether this is the same or different from the “transmitting memory element” of claim 11. Line 3 recites, “the receiving buffer”. It is unclear whether this is the same or different from the “receiving memory element” of claim 11.

xi. Claim 17 is rejected for the same reasons as claim 7 above.

xii. Claim 19 is rejected for the same reasons as claim 9 above.

xiii. Claim 31 line 2 recites, “a first virtual machine having a first virtual device”. Claim 31 line 4 recites, “a second virtual machine having a second virtual device. It is unclear how a piece of software, (i.e. virtual machine) can contain a piece of hardware, (i.e. virtual device). Claim 35 and the specification provide evidence that a virtual device is a hardware component.

xiv. Claim 31 line 6 recites, “a shared physical memory element”. It is unclear which components share the memory element.

xv. Claim 31 line 8 recites, "a first virtual machine". Line 9 recites, "a second virtual machine". Lines 10-11 recite, "a first virtual memory element. Line 11 recites, "a second virtual memory element. Line 12 recites, "a shared physical memory element. It is unclear whether these components are the same or different from their respective components mentioned earlier in claim 31. If they are the same, "the" or "said" should be used.

xvi. Claim 32 lines 3-4 recite, "a shared physical memory element. It is unclear whether this is the same or different from the shared physical memory element of claim 31. If it is the same, "the" or "said" should be used.

xvii. Claim 34 lines 1-2 recite, "wherein the cross-talk detector is further capable of detecting". Line 4 recites, "the dynamic memory remapper is further capable of dynamically remapping". It is unclear whether the step of detecting and remapping is actually performed. Applicant is advised to remove the "is capable" language.

xviii. Claim 35 lines 1-2 recite, "wherein the cross-talk detector is further capable of monitoring". It is unclear whether the step of monitoring is actually performed. Applicant is advised to remove the "is capable" language.

xix. Claim 39 line 4 recites, "wherein the dynamic memory remapper is capable of mapping". It is unclear whether the step of mapping is actually

performed. Applicant is advised to remove the "is capable" language. Line 4 recites, "a transmitting memory element". Line 6 recites, "a receiving memory element". It is unclear whether these components are the same or different from their respective components mentioned earlier in claim 38. If they are the same, "the" or "said" should be used.

xx. Claim 40 line 2 recites, "to a second virtual memory element". This should read, "and the second virtual memory element".

xxi. Claim 45 line 3 recites, "a packet". It is unclear if this is the same or different from the packet of claim 44.

xxii. Claim 47 lines 1-2 recite, "a first virtual machine" and "a second virtual machine. It is unclear whether these components are the same or different from their respective components mentioned earlier in claim 41. If they are the same, "the" or "said" should be used.

xxiii. Claim 48 lines 5 and 7 recite, "a shared physical memory element". Applicant is advised to clarify the claims by amending the claim to recite "a first shared physical memory element" since claim 49 indicates a "second shared physical memory element.

xxiv. Claims 50-52, and 57-59 are rejected for the same reasons as claim 47 above.

xxv. Claim 53 recites, "the shared physical memory element". It is unclear whether the shared physical memory element refers to the first or second shared physical memory of claim 50.

xxvi. Claim 55 lines 6-7 and 9 recite, "a shared physical memory element". Applicant is advised to clarify the claims by amending the claim to recite "a first shared physical memory element" since claim 56 indicates a "second shared physical memory element."

xxvii. Claim 60 is rejected for the same reasons as claim 53 above.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claim 1-2, and 11-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Haggar et al. (US PG Pub No. US 2003/0135658 A1).

11. Regarding claim 1, Haggar teaches a method comprising:

detecting that a first virtual machine is attempting to transmit data to a second virtual machine ([0034] lines 5-7);

mapping a transmitting memory element of the first virtual machine to a shared physical memory element ([0036] lines 7-9, wherein the first virtual machine defines a shared memory area); and

mapping a receiving memory element of the second virtual machine to the shared physical memory element ([0036] lines 7-9);

placing data from the first virtual machine into the shared physical memory element via the transmitting memory element ([0034]); and

receiving the placed data from the shared physical memory element into the second virtual machine via the receiving memory element ([0039] lines 8-10, wherein the multiple processes can receive data via the shared memory).

12. Regarding claim 2, Haggar teaches further including:

detecting that the first virtual machine has placed data in the shared physical memory element ([0035] wherein a semaphore is set indicating the existence of a shared memory); and

informing the second virtual machine that data is available in the shared physical memory element ([0036]).

13. Regarding claims 11-12, they are the article claims of claims 1-2 above.

Therefore, they are rejected for the same reasons as claim 1-2 above.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 1-2, 11-12, and 48-53 and 55-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shultz et al. (US Pat No. 7,181,744).

16. Regarding claim 1, Shultz teaches a method comprising:

detecting that a first virtual machine is attempting to transmit data to a second virtual machine (col 6 lines 16-20, wherein the operation is performed when a first virtual machine desires to send data to a second virtual machine);

mapping a transmitting memory element of the first virtual machine to a shared physical memory element (col 6 lines 20-25, wherein the virtual machine has access to shared memory by providing the appropriate address, i.e. mapping an address to the shared physical memory); and

placing data from the first virtual machine into the shared physical memory element via the transmitting memory element (col 6 lines 19-20, wherein the data is written); and

receiving the placed data from the shared physical memory element into the second virtual machine (col 6 lines 38-42, wherein the message is retrieved by the second virtual machine).

17. Shultz does not explicitly teach mapping a receiving memory element of the second virtual machine to the shared physical memory element. However, it would have been obvious to one of ordinary skill in the art to modify Shultz to explicitly teach mapping a receiving memory element of the second virtual machine. One would be motivated by the desire to ensure that the data to be transferred would be addressed appropriately as opposed to being written into an arbitrary location.

18. Regarding claim 2, Shultz teaches further including:

detecting that the first virtual machine has placed data in the shared physical memory element (col 6 lines 43-46, wherein the step is performed as a result of data being placed in the shared memory); and

informing the second virtual machine that data is available in the shared physical memory element (col 6 lines 47-49).

19. Regarding claims 11-12, they are the article claims of claims 1-2 above. Therefore, they are rejected for the same reasons as claim 1-2 above.

20. Regarding claim 48, Shultz teaches a method comprising:

detecting that a first virtual machine is configured to transmit data to a second virtual machine (col 6 lines 16-20, wherein the operation is performed when a first virtual machine desires to send data to a second virtual machine);

statically mapping a transmitting memory element of the first virtual machine to a shared physical memory element (col 6 lines 20-25, wherein the virtual machine has access to shared memory by providing the appropriate address, i.e. mapping an address to the shared physical memory);

placing data from the first virtual machine into the shared physical memory element via the transmitting memory element (col 6 lines 19-20, wherein the data is written); and

receiving the placed data from the shared physical memory element into the second virtual machine via the receiving memory element (col 6 lines 38-42, wherein the message is retrieved by the second virtual machine).

21. Shultz does not explicitly teach statically mapping a receiving memory element of the second virtual machine to the shared physical memory element. However, it would have been obvious to one of ordinary skill in the art to modify Shultz to explicitly teach mapping a receiving memory element of the second virtual machine. One would be motivated by the desire to ensure that the data to be transferred would be addressed appropriately as opposed to being written into an arbitrary location.

22. Regarding claim 49, Shultz does not teach:

statically mapping a receiving memory element of the first virtual machine to a second shared physical memory element; statically mapping a transmitting memory element of the second virtual machine to the second shared physical memory element; placing data from the second virtual machine into the second shared physical memory element via the transmitting memory element of the second virtual machine; and receiving the placed data from the shared physical memory element into the first virtual machine via the receiving memory element of the first virtual machine.

23. It is old and well known in the art to perform bidirectional communication as indicated by AAPA (pg 3 line 19). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to map the virtual machines to a second shared physical memory element. One would be motivated by the desire to enable bidirectional communication while maintaining data integrity of the two memory elements.

24. Regarding claim 50, Shultz does not teach detecting that a first virtual machine is configured to transmit data to a second virtual machine is performed when the first virtual machine is started.

25. It would have been obvious to one of ordinary skill in the art at the time of the invention to perform the detection upon initialization. One would be motivated by the desire to increase the efficiency of the system by performing the mapping of resources upon start up.

26. Regarding claims 51 and 52, Shultz does not teach that detecting that a first virtual machine is configured to transmit data to a second virtual machine includes reading a configuration file that explicitly or implicitly denotes that the first and second virtual machines are virtually coupled.

27. It would have been obvious to one of ordinary skill in the art at the time of the invention to read configuration data that denotes whether the virtual machines are virtually coupled. Configuration information is well known in the art to define arrangement of systems. One would be motivated by the desire to define ahead of time the arrangement of virtual machines in such a system.

28. Regarding claim 53, Shultz does not teach that the shared physical memory element comprises a direct access memory buffer.

29. It would have been well known to one of ordinary skill in the art at the time of invention to utilize a direct memory access buffer. The Microsoft Computer Dictionary (Fifth Edition, 2002) teaches that DMA is "frequently used for data transfer directly between memory and an 'intelligent' peripheral device".

30. Regarding claims 55-60, they are the article claims of claims 48-53 above. Therefore, they are rejected for the same reasons as claims 48-53 above.

31. Claims 3-10, 13-20, 31-40, 54, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shultz et al. (US Pat No. 7,181,744) as applied to claims 1-2, 11-12, 48-53, and 55-60 above, further in view of Applicant's Admitted Prior Art (AAPA).

32. Regarding claim 3, Shultz does not teach detecting if the first virtual machine is attempting to transmit data to a non-virtual machine; dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element.

33. AAPA teaches these features in pg 3 lines 20-23 and lines 14-16 respectively. It would have been obvious to one of ordinary skill in the art to modify Macchiano to allow to the transmission of data to non-virtual machines. One would be motivated by the desire to support communications with a wider range of systems.

34. Regarding claim 4, AAPA teaches wherein the transmitting memory element of the first virtual machine is part of a first virtual device; and the receiving memory element of the second virtual machine is part of a second virtual device (Fig 1 and pg 4 lines 1-2).

35. Regarding claim 5, AAPA teaches that the first virtual device and the second virtual device are devices selected from a group including: an Ethernet device, a network interface, an audio device, a storage device, and a video device (pg 3 lines 9-10).

36. Regarding claim 6, AAPA does not teach that the shared physical memory element is a direct memory access (DMA) buffer.

37. It would have been well known to one of ordinary skill in the art at the time of invention to utilize a direct memory access buffer. The Microsoft Computer Dictionary (Fifth Edition, 2002) teaches that DMA is "frequently used for data transfer directly between memory and an 'intelligent' peripheral device".

38. Regarding claim 7, AAPA teaches that detecting that a first virtual machine is attempting to transmit data to a second virtual machine includes:

monitoring the first virtual machine (pg 3 lines 14-16).

39. AAPA does not explicitly teach comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine.

40. It would have been obvious to perform this comparison. It is well known that the act of transmitting data requires a destination address. Therefore, the step of detecting an address match would have been well known.

41. Regarding claim 8, Shultz and AAPA do not explicitly teach that detecting that a first virtual machine is attempting to transmit data to a second virtual machine includes:

reading a mapping configuration data that specifies default virtual device to physical device mappings;

comparing the mapping configuration data for the first virtual machine to the mapping configuration data of the second virtual machine;

assuming that the first virtual machine is attempting to transmit data to the second virtual machine, if a transmitting virtual device of the first virtual machine is mapped to the same physical device as the receiving virtual device of the second virtual machine.

42. It would have been obvious to one of ordinary skill in the art to read and compare mapping data. In order to transmit data, it would have been well known to determine whether both virtual machines were connected to the same device. Therefore, one would be motivated by the desire to determine whether the two virtual machines were mapped to the same device.

43. Regarding claim 9, AAPA teaches that mapping a transmitting memory element of the first virtual machine to a shared physical memory element includes: determining if the transmitting memory element is currently mapped to a transmitting memory element of a physical device; if so, unmapping of the transmitting memory element from the transmitting memory element of the physical device; and remapping the transmitting memory element of the first virtual machine to the shared physical memory element (pg 3 lines 10-19, wherein it is inherent that the VMM would remap the virtual devices depending on resource requirements).

44. Regarding claim 10, AAPA teaches detecting that the second virtual machine is attempting to transmit data to the first virtual machine; mapping a transmitting memory element of the second virtual machine to the shared physical memory element; and mapping a receiving memory element of the first virtual machine to the shared physical memory element (pg 3 lines 17-19, wherein it is inherent that the virtual machines could be switched to perform bi-directional communication).

45. Regarding claims 13-20, they are the article claims of claims 3-10 above. Therefore, they are rejected for the same reasons as claims 3-10 above.

46. Regarding claim 31, Shultz teaches a system comprising a virtual machine system having a first and second virtual machine, the first and second virtual machine having access to a shared physical memory (col 6 lines 16-25). However, Shultz does not explicitly teach a cross-talk detector in communication with the virtual machine system to detect if a first virtual machine is attempting to transmit data to a second virtual machine and a dynamic memory remapper to, upon detecting by the cross-talk detector that the first virtual machine is attempting to transmit data to the second virtual machine, map a first virtual memory of the first virtual machine to a second virtual memory of the second virtual machine via the shared physical memory element.

47. AAPA implies that the VMM can be utilized as a cross-talk detector (pg 4 lines 3-5 and pg 3 lines 4-6). It would have been obvious to one of ordinary skill in the art to utilize a memory remapper to implement the loopback solution taught by AAPA (pg 4

lines 6-8). AAPA also teaches that the VM assures that the virtual machines are mapped correctly (pg 3 lines 14-19).

48. Regarding claim 32, AAPA teaches that the dynamic memory remapper is capable of: mapping a transmitting memory element of the first virtual machine to a shared physical memory element; and mapping a receiving memory element of the second virtual machine to the shared physical memory element (pg 3 lines 7-12).

49. Regarding claim 33, Shultz and AAPA do not teach that the cross-talk detector is further capable of: detecting that the first virtual machine has placed data in the shared physical memory element; and informing the second virtual machine that data is available in the shared physical memory element.

50. It would have been well known to one of ordinary skill in the art at the time of the invention to perform the steps of detecting the placement of data and informing the second virtual machine that such data is available. Since resources are shared among the various virtual machines, it would have been well known to one of ordinary skill that continuously polling such resources by the second virtual machine would be highly inefficient. As a result, directly informing the second virtual machine would be a more preferable course of action.

51. Regarding claim 34, AAPA teaches that the cross-talk detector is further capable of detecting if the first virtual machine is attempting to transmit data to a non-virtual

machine (pg 3 lines 20-23); and the dynamic memory remapper is further capable of dynamically remapping the transmitting memory element of the first virtual machine to a physical device associated with the transmitting memory element (pg 3 lines 14-16).

52. Regarding claim 35, AAPA teaches that the cross-talk detector is further capable of monitoring the first and second memories wherein the memories are part of virtual devices selected from a group including: an Ethernet device, a network interface, an audio device, a storage device, and a video device (pg 3 lines 9-10).

53. Regarding claim 36, Shultz and AAPA do not teach that the shared physical memory element is a direct memory access (DMA) buffer.

54. It would have been well known to one of ordinary skill in the art at the time of invention to utilize a direct memory access buffer. The Microsoft Computer Dictionary (Fifth Edition, 2002) teaches that DMA is “frequently used for data transfer directly between memory and an ‘intelligent’ peripheral device”.

55. Regarding claim 37, AAPA teaches that the cross-talk detector is capable of: monitoring the first virtual machine (pg 3 lines 14-16).

56. AAPA does not explicitly teach comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine.

It would have been obvious to perform this comparison. It is well known that the act of transmitting data requires a destination address. Therefore, the step of detecting an address match would have been well known.

57. Regarding claim 38, AAPA teaches that the dynamic memory remapper is capable of: determining if the transmitting memory element is currently mapped to a transmitting memory element of a physical device; if so, unmapping of the transmitting memory element from the transmitting memory element of the physical device; and remapping the transmitting memory element of the first virtual machine to the shared physical memory element (pg 3 lines 10-19, wherein it is inherent that the VMM would remap the virtual devices depending on resource requirements).

58. Regarding claim 39, AAPA teaches that the cross-talk detector is capable of detecting that the second virtual machine is attempting to transmit data to the first virtual machine; and wherein the dynamic memory remapper is capable of mapping a transmitting memory element of the second virtual machine to the shared physical memory element; and mapping a receiving memory element of the first virtual machine to the shared physical memory element (pg 3 lines 17-19, wherein it is inherent that the virtual machines could be switched to perform bi-directional communication).

59. Regarding claim 40, AAPA teaches that the first virtual memory element of the first virtual machine to a second virtual memory element of the second virtual machine are not identical but share substantially similar characteristics (Figure 1, 181 and 182).

60. Regarding claim 54, Shultz does not teach that the virtual memory elements of the first and second virtual machines are part of virtual devices selected from a group of virtual devices comprising: an Ethernet device; a network device; an audio device; a storage device; and a video device.

61. AAPA teaches that virtual machines see virtual devices which may be mapped to a physical device such as a network interface card (pg 3 lines 9-12). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Shultz to allow mapping of a virtual machine to access a physical device. One would be motivated by the desire to allow for communication with external networks.

62. Regarding claim 61, it is the article claim of claim 54 above. Therefore, it is rejected for the same reasons as claim 54 above.

63. Claims 41-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Macchiano et al. (US Pat No. 7,111,303), further in view of Applicant's Admitted Prior Art (AAPA).

64. Regarding claim 41, Macchiano teaches a method of communicating between two virtual machines utilizing a virtual machine manager comprising:

detecting that a first virtual machine, having a first virtual network interface, is attempting to transmit data to a second virtual machine, having a second virtual network interface, via the virtual network interfaces (col 3 lines 31-35, therein the invention is able to detect that data should be transmitted);

mapping a transmitting memory element of the first virtual network interface to a virtual LAN (col 5 lines 4-6 and 54-58); and

mapping a receiving memory element of the second virtual network interface to the virtual LAN (col 5 lines 4-6 and 54-58);

placing data from the first virtual machine into the direct memory access buffer via the transmitting memory element of the first virtual network interface (col 5 lines 4-6 and 54-58, wherein communication is to be performed); and

receiving the placed data from the direct memory access buffer into the second virtual machine via the receiving memory element of the second virtual network interface (col 5 lines 4-6 and 54-58, wherein communication is to be performed).

65. Macchiano does not explicitly teach mapping to a first direct memory access buffer. Macchiano's invention is directed towards creating a virtual LAN to facilitate communications between two virtual machines without using a physical network layer. Therefore, the virtual LAN is equivalent to a direct memory access buffer in that it acts as a medium to allow the sending and retrieval of transmitted data.

66. Macchiano also does not teach mapping a to a second direct memory access buffer for transmitting data from the second virtual machine to the first virtual machine.

67. AAPA teaches mapping a transmitting buffer (Fig 1, component 181) and a receive buffer (Fig 1, component 182) on a physical device in order to facilitate data transfers. AAPA teaches that Fig 1 teaches an embodiment wherein the first VM illustrates the write case and the second VM illustrates the read case, however, bi-direction communication is often the norm (pg 3 lines 13-19).

68. It would have been obvious to one of ordinary skill in the art at the time of the invention to map a second direct memory access buffer. One would be motivated by the desire to facilitate bi-direction communication as indicated by AAPA.

69. Regarding claim 42, Macchiano teaches:

detecting that the first virtual machine has placed data in the direct memory access buffer (col 9 lines 8-11); and

informing the second virtual machine that data is available in the direct memory access buffer (Fig 6, step 216 and col 9 lines 27-29).

70. Regarding claim 43, Macchiano does not explicitly teach that the first virtual machine:

placing at least one packet into the direct memory access buffer; and

moving a tail register of the first virtual network interface to indicate how many packets were written to the direct memory access buffer.

71. Macchiano teaches using a virtual LAN along with IP protocols that enables such communication (col 9 lines 2-7). It is well known that an IP header contains the total length attribute to indicate the message size. Therefore, it would have been obvious to one of ordinary skill in the art to place at least one packet into the direct memory access buffer and to move the tail register of the first virtual network interface to indicate how many packets were written to the direct memory access buffer.

72. Regarding claim 44, Macchiano teaches further comprising the virtual machine manager:

sending a receive interrupt to the second virtual machine (col 9 line 28).

73. Macchiano does not explicitly teach moving a receive descriptor head register of the second virtual network interface by a number of packets written to the direct memory access buffer and updating the status of the second network interface to indicate that a packet has been received.

74. It would have been obvious to one of ordinary skill in the art at the time of the invention to move the receive descriptor head register of the second network interface by the number of packets written to the direct memory access buffer and updating the status of the second network interface to indicate that a packet has been received. It is well known in the art to allocate an appropriately sized buffer to receiving data. Furthermore, it is well known to send an acknowledge signal when receiving a packet.

75. Regarding claim 45, Macchiano teaches further comprising the second virtual machine: reading a packet from the direct memory access buffer (col 9 lines 41-43).

76. Regarding claim 46, Macchiano does not explicitly teach further comprising, the virtual machine manager:

detecting that the second virtual machine has read the packet from the direct memory buffer;

updating the status of the first network interface to indicate that the packet has been received; and

injecting a transmit complete interrupt to the first virtual machine.

77. It would have been obvious to one of ordinary skill in the art at the time of the invention to detect the data read, update the status, and inject a transmit complete interrupt. It is well known in that network communications frequently utilize an acknowledge signal to indicate to the sender that transmission is successful.

78. Regarding claim 47, Macchiano teaches that detecting that a first virtual machine is attempting to transmit data to a second virtual machine includes: monitoring the first virtual machine; comparing a destination of any data transmitted by the first virtual machine to an address associated with the second virtual machine (col 9 lines 12-20).

Response to Arguments

79. Applicant's arguments with respect to claims 1-20, 31-40, and 48-61 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

80. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric C. Wai whose telephone number is 571-270-1012. The examiner can normally be reached on Mon-Thurs, 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng - Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Meng-Ai An/

/Eric C Wai/

